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Evaluation of Manually Operated Raw Mango Cutting Machine

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ABSTRACT

Raw mangoes in India are mostly used as pickles and chutneys. Pickles are prepared in almost every Indian house and also commercially and famous within country.The developed manually operated raw mango cutting machine consists of the main frame, tray, cutting unit having cutting blades, cutter guide, handle, pedal lever and spout. The machine was easy to operate with higher output capacity of 400kg/day with 54 per cent labour saving over traditional tool. The blades of the machine were made by stainless steel, so after cutting no blackish colour was observed on cutting portion of raw mango. The average of 10 subjects for overall discomfort rate of raw mango cutting machine was found to be 3.70 and 4.90 for first and second test, respectively.

Key Words: Labour saving, Machine, Manually operated, Output capacity, Raw mango.

INTRODUCTION

Mango is a seasonal fruit, about 20 per cent of fruits are processed for products such as puree, nectar, leather, pickles, canned slices, and chutney (Ravani and Joshi, 2013). Pickles are prepared in almost every Indian house and also commercially and famous within country. In Maharashtra, mango is grown in an area of 157.07 thousand ha with 514.87 thousand MT production (Anon, 2017).Raw mangoes are available only for 2-3 months of year and have very limited shelf life. Mango is a rich source of carotenoids and provides high contents of ascorbic acid and phenolic compounds and has been recognized as king of the fruit in India (Pott *et al*, 2003). Mango is one of the most cherished fruits, not only in flavour and taste, but also for its nutritional value (Kad *et al*, 2017).

The cutting raw mango by using traditional tool is time and lobor consuming operation also is not safe because it lead to injuries like cutting workers hand and fingers and also difficult to cut the mango because of presence of its hard seed. The mild steel blade used in traditional tool, so after cutting blackish colour was observed on cut portion of raw mango and in unhygienic ways. Hence, it is very necessary to developing manually operated machines which can reduce the time as well as cost of operation under hygienic conditions. Patil and Chendake (2017) reported that highest cutting rate of raw mangoes observed with standing model of multipurpose machine might be due to most comfortable working posture than other two models. At the same time, traditional cutting blade required to be operated in sitting posture by holding the frame with leg which lead to more stress in legs hence least cutting rate was recorded.

Therefore, the present study was undertaken to develop an appropriate manully operated raw mango cutting machine for the small scale pickle processing industry.Freshly harvested mango fruit of cultivar Phule Abhiruchi recommended for pickle by MPKV, Rahuri (Gaikwad *et al*, 2018) were used to test the peformance of the machine.

MATERIALS AND METHODS

The developed manually operated raw mango cutting machine consists of the following components.

1. Main frame 2. Tray 3. Cutting unit a) Cutting blades b) Cutter guide

4. Handle and pedal lever and 5. Spout

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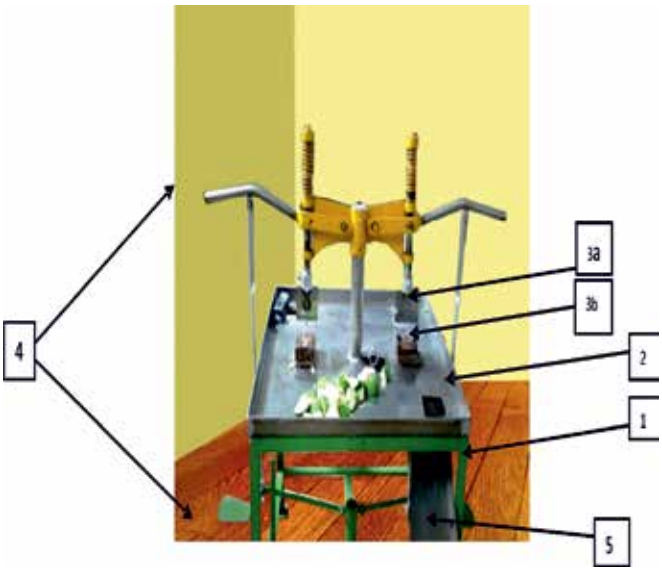

Fig 1 :Manually Operated Raw Mango Cutting Machine

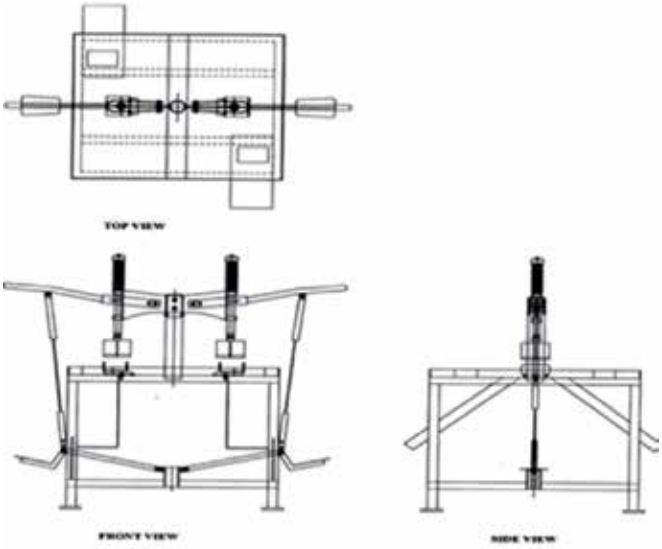

Fig 2 :Top view, Front view and Side view of Manually Operated Raw MangoCutting Machine.

Overall discomfort score

For the assessment of overall discomfort rating, a 10-point Visual Analogue Discomfort Scale (0- No discomfort, 10- Extreme discomfort) was used (Corlett and Bishop, 1976). A scale having 0 to 10 digits marked on it equidistantly. At the end of each trial, subjects were asked to indicate their overall discomfort rating on the scale.

RESULTS AND DISCUSSION

The development and performance evaluation of manually operated raw mango cutting machine was carried out at Department of Agricultural Process Engineering, Dr A S College of Agricultural Engineering and Technology, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (MS). The average length, width, thickness and weight of mango Cv. Phule Abhiruchi were 91.45mm, 67.80mm, 62.51mm and 224.50g, respectively**.**The machine was operated by two operators using hand and pedal. The first operator used single blade for two halves of raw mango and second operator used cross blade for further cutting of raw mangoes into four halves. The output capacity of the machine was found 55.01 kg/hr (Table 1). The comparison of traditional tool and developed raw mango cutting machine (Table 2) stated that the machine was easy to operate with higher output capacity. The output capacity of Phule raw mango cutting machine was 400 kg/day with 54 per cent labour saving over traditional tool. The blades of the machine were made by stainless steel, so after cutting no blackish colour was observed on cutting portion of raw mango.

Overall discomfort score

The average of 10 subjects for overall discomfort rate for raw mango cutting machine showed in Table 3 were 3.70 and 4.90 for first and second test, respectively.

CONCLUSION

The developed manually operated raw mango cutting machine is easy to use with output capacity 40-60 kg/hr. No blackish colour was observed on cutting portion of raw mango. The labour saving was found to be 54 per cent over traditional method. The average of 10 subject for overall discomfort rate for raw mango cutting machine were 3.70 and 4.90 for first and second test, respectively.

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Table 1. Test data of performance evaluation of manually operated raw mango cutting machine.

Sr. No.		Particular	Obtained data
1	i.	Test duration, hr	40
	ii.	Weight of raw mangoes, kg	2200.44
	iii.	Output capacity, kg/hr	55.01
	iv.	Number of labour required	2
2		Ease of operation	Easy
3		Labor saving over traditional method, Per cent	54

Table 2. Comparison of traditional tool and developed raw mango cutting machine.

Particular	Traditional method	Raw mango cutting machine
Time, min	60	60
Output capacity, kg/hr	8 -15	40 - 60
Ease of operation	Difficult	Easy
Collecting unit	Not available	Available
Metal of cutting blade	Mild Steel	Stainless Steel
Colour of cut portion of raw mango	Blackish	No colour change
Output capacity, kg/day (for 8 hrs and 2 labor)	184	400
labor saving over traditional method, Per cent	-	54

Table 3. Overall discomforts rating.

Particular	Overall discomfort rate	
	Test 1 (Day 1)	Test 2 (Day 2)
S1	3	4
S2	5	6
S3	4	5
S4	3	4
S5	4	5
S6	3	5
S7	3	4
S8	5	7
S9	4	5
S10	3	4
Average	**3.70**	**4.90**

*S1 to S10 is the different operating persons

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